

September 8, 2004

AUTHORIZATION:

The Jefferson Lab EH&S Manual, Chapter 6110 *Lockout/Tagout*, implements OSHA's LO/TO Regulations (29CFR1910.147). OSHA requires employers to conduct a periodic inspection of energy control procedures to ensure the provisions of CFR 1910.147 are met.

PURPOSE:

This report satisfies the requirements of 29 CFR 1910.147 (c)(6).

SCOPE:

Jefferson Lab consists of over 100 independent structures. A thorough inspection was conducted in 36 of these buildings representing the majority of the experimental and technical work areas. Each electrical distribution panel and exposed piping system was visually inspected for LO/TO application. The availability of LO locks and tags in each area, as well as the existence of previously used tags, were also reviewed. Because OSHA Regulation CFR 1910.147 deals exclusively with LO/TO for maintenance and service, of the 258 LO/TO applications observed only 49 fit in this category.

SUMMARY:

Jefferson Labs LO/TO program, as it applies OSHA Regulations, was near perfect during this audit with a score of 99.84 out of a maximum 100 points. Taggers exhibited good knowledge of LO/TO procedures and showed initiative in correcting the few minor LO/TO violations. Tagger knowledge was determined from random, informal interviews conducted during the audit. Locks and tags were readily available at central locations throughout the site and easily accessible to taggers as needed. Inspection dates coincided with the work schedules of the two inspectors and the availability of the accelerator tunnel and the three experimental halls.

Methods:

A scoring criteria developed several years ago was used to quantify the inspection findings. The scoring system used is contained in Appendix A, *Scoring System for Lockout/Tagout Evaluation*.

No deficiencies listed in Appendix A under categories numbered 1,2,3,4,7,or 9 were found. Number 5 deficiencies, "Tag is missing," were observed in listed locations on site.

Number 8 deficiencies, “Incorrect lock used,” were found in several locations. The score is calculated in accordance with Appendix A.

Scoring Matrix:

RISK CODE	0	1	2	3	4	100	SCORE
# of Observations	1	2	0	0	0	.81	Penalty Points
Corrective Actions	1	2	0	0	0	.65	Credit Points (80%)
						99.8	Observational Score

Scoring Notes

1. The 1 Risk Code “0” entry represents a missing tag.
2. The 2 Risk Code “1” entries represent missing tag and information on a lock and a miss applied lock.
3. There were a total of 49 LO/TO instances observed. Of that total, there were 3 violations.

DISCUSSION:

The number of Lockout/Tagout instances covered in this audit is significantly lower than previous audits. In the past, all LO/TO observations were included in the score regardless if they were for maintenance/service or administrative. The majority of the lockout/tagout instances observed were administrative tags applied by groups who have a longstanding procedure for locking and controlling their individual systems. This includes the PSS system, the cryogenic systems and the fire control systems. However, there is a wide range of application of the administrative LO/TO’s on site. For example, the PSS system uses a unique tag not covered in the Jefferson Lab EH&S Manual, Chapter 6110 *Lockout/Tagout* and uses plastic tie wraps instead of locks. The fire control system sometimes uses just tags, or just locks. Many manual valves are tagged on/off without a lock and some still have the old yellow CEBAF “DON’T TURN ON/OFF” tag. It was also observed that the equipment in the machine shops in buildings #58 and 90 were administratively locked with the “Key Watch” system but had no tags. This system was blessed in last year’s report but is not formally addressed in Chapter 6110. And finally, in many instances administrative locks are applied without hasps as required. Because the administrative LO/TO’s do not fall under OSHA regulations their occurrence but not compliance is included in the report for information only.

CONCLUSION:

The Lab’s LO/TO program as it applies to maintenance and service and including the taggers’ understanding of its use, is solid.

RECOMMENDATIONS:

Jefferson Lab's program for maintenance and service LO/TO appears to be understood and effectively implemented. The Lab has improved its application of LO/TO since the previous review and this progress should continue. Some specific recommendations follow:

1. Continue with the effective training for taggers but reemphasis administrative LO/TO procedures.
2. Update EH&S manual to include PSS tags and Key Watch systems.
3. Remove all outdated tags in inventory and use; replace with current LO/TO tags.

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Facilities Inspected:

BUILDING INSPECTED	DATE
01 – North Linac Service Building	8/6/04
02 – South Linac Service Building	8/6/04
04 – Exit Stair #4	8/6/04
08 – Central Helium Liquifier	8/6/04
10 – Cryo Maintenance Trailer	8/6/04
18 – Free Electron Laser Building	8/6/04
21 – North Extraction Spreader Service Building	8/6/04
37 – Exit Stair #2	8/6/04
38 - South Access Service Building	8/6/04
39 – East ARC Service Building #E2	8/6/04
40 – West ARC Service Building #W4	8/6/04
45 – West ARC Service Building #W5	8/6/04
49 – East Arc Service Building #E3	8/6/04
50 – East ARC Service Building #E5	8/6/04
53 – Injector Service Building	8/6/04
56 – West Arc Service Building #W3	8/6/04
58 – Test Lab	7/27/04
63 – East Arc Service Building #E4	8/6/04
67 – North Access Building	8/6/04
68 – West ARC Service Building	8/6/04
72 – Physics Storage Building	8/6/04
82 – South Extraction Spreader Service Building	8/6/04
85 – Machine Control Center	8/6/04
87 – ACC Maintenance & Support Building	8/6/04
90 – Experimental Equipment Lab	7/27/04
94 – Experimental Hall B	8/6/04
94A Maintenance Trailer	8/6/04
96 – Experimental Hall C	8/6/04
96B – Hall B Gas Shed	8/6/04
96C – Hall C Gas Shed	8/6/04
96D – Installation Trailer, Hall B	8/6/04
97 – Counting House	8/6/04
98 – Cryo Weld Shop/Service Building	8/6/04
101 – Experimental Hall A	8/6/04
101B – Physic Trailer, Hall A	8/6/04
102 End Station Refrigerator Building	8/6/04

LOTO Observations (Numbers in Bold are for audit)

BUILDING /LOTO OBSERVATION	GOOD	RISK 0	RISK 1	TOTAL
<u>#1 North LANAC Service Building</u>				
NL1/SB circuit 9	1			
NL1/-SB circuit 1 1,18,19	3			
NL1/SB1 circuit 5	1			
NL1/SB1 circuit 12	1			
NL2/SB circuit 13	1			
NL2/SB circuit 15			1(no name on lock + no tag)	
NL2/SB circuit 16	1			
Welding circuit #3	1			
PS#1	3			
PP4 circuits 7, 8	2			
P-2 circuits 19, 21, 23, 24	4			
P3 circuits 3, 15	2			
MNL-27 #5	1			5/17
<u>#2 South LANAC Service Building</u>				
SL-P1 circuits 9, 10, 20	3			
SL-P3 circuit 29	1			
SL-PP5 circuit 7	1			
SL1/SB-8	1			
SL-L1/Sect.1 circuit 10	1			
SL1/SB-18	1			
SL-P2 circuits 1, 14, 16, 20	4			
SL2-SB circuit 15	5			
SL3/ 13	1			
SL09B14 circuits 17, 18	2			
SL10B14	2			
SL10B14 circuits 17, 18	2			
Power supply CPS Zone 9	5			14/15
<u>#8 Central Helium Liquifier</u>				
CB Panel circuits 6, 9	2			
CB Panel K-1 circuits 10, 21	2			
CB Panel K-2 circuits 16, 22	2			
MDP Panel circuit 10	1			
SBR Switch/Breaker 4 circuits 2, 8, 9	3			
CHL MCC Cold return compressor	1			
K-2P1 circuit 24			1 (lock applied wrong)	
CHP-P2 circuits 12, 22	2			
Condenser By-pass cooling water MV's 1, 2	2			

BUILDING /LOTO OBSERVATION	Good	Risk 0	Risk 1	Total
<u>#8 Central Helium Liquifier (cont.)</u>				
MV 50K supply/return	2			
MV's MCC-A Air compressor supply/return	2			
MV 19-76	1			
MV Air-to-2K cold box	1			
MV CHL-C7F	1			
MV CHL-SW1	1			
MV 10TS1	1			
MV 10TS2	1			
MV SCN-Cool-down	2			2/26
<u>#18 Free Electron Laser Building</u>				
PNL U500 circuits 7, 9, 11	3			
E100 circuits 2, 7	2			
E200 circuit 28	1			
E300 circuits 22, 23	2			
E900 circuits 1, 7, 13, 16, 19, 22	6			
E900a circuits 2, 4, 6, 8, 12	5			
E1000 circuits 8, 13	2			
E1100 circuits 13, 14, 20, 32, 38	5			
E1200 circuit 29	1			
E1500 circuits 7, 8, 13, 16	4			
HV Power Supply, #3 injector	1			
HV Power Supply #4 injector	1			
Switch Gear #2 circuits 1, 2, 21	3			
MV's for Cool Down System, supply/return	2			7/31
<u>#21 North Extraction Spreader Service Building</u>				
EP-1 circuit 10	1			1
<u>#37 Exit Stair #2</u>				
EX2-P/6	1			1
<u># 38 South Access Building</u>				
SA1-SB-8	1			
SA-MCC LCW pump PS4	1			2
<u>#39 East Arc Service Building #E2</u>				
E2P circuits 7, 12, 14, 24	4			4

BUILDING /LOTO OBSERVATION	Good	Risk 0	Risk 1	Total
#40 West Arc Service Building #W4 W4-P circuits 8, 14	2			2
#45 West Arc Service Building #W5 W5-L/9	1			1
#49 East Arc service Building #E3 E3 circuit 12	1			1
#50 East Arc service Building #E5 E5 circuits 12, 14	2			2
#53 Injector Service Building IB P1 circuit 3 MDP Panel #7	1 1			2
#58 Test Lab P600 circuit 10 & 31 P500 circuit 4 L1700 circuits 15 & 21 L2150A circuit 27 L2200 circuit 29 L2800 tap MTL1 circuit 4 MDP1SU circuit 12 FEL P2 circuit 16 FEL L1 circuit 2 PWR Supply, magnet testing BTLLPEG HV supply cables LHe Supply & Return lines (in laser cave) HKS dipole Wave guide (in test cave) GN2 manifold (near west roll up door) Sprinkler stand pipe LCW Supply & Return pipes (Primex Magnet) Switch gear #1, MCC-2B # 58 Machine Shop Machinery (secured using "KeyWatch") Welding Plug	2 1 2 1 1 1 1 1 1 1 1 1 2 2 1 2 1 1 12 1	1 (unkno wn combo lock also applied)		9/30

BUILDING /LOTO OBSERVATION	Good	Risk 0	Risk 1	Total
<u>#63 East Arc Service Building #E4</u> E4-P-18	1			1
<u>#67 North Access Building</u> NA1-10 NA-EM circuit 20 NA-PSS circuit 42 circuit 9-42 Power Supply MNO2-RSEP8a MV Bypass LCW DEOX System	1 1 1 1 1 1			1/6
<u>#68 West Arc service Building #W2</u> W1-MDP circuit 7 Power Supply Alpha 6	1	1(no tag)		2
<u>#82 South Extraction Spreader Service Building</u> W1-P1 circuit 8 W2-P1 circuits 4, 6, 13 W2-P2 circuits 1, 19	1 3 2			6
<u>#85 Machine Control Center</u> MCC-NA circuit 3 MCP circuits 1, 3-7, 9, 11,14 MCPP circuit 4 MCPPA circuits 36, 40	1 9 1 2			1/12
<u>#87 ACC Maintenance & Support Building</u> NL1-SB 16-10	1			1
<u>#90 Experimental Equipment Lab</u> MP1 Circuit 21 MP2 circuit 10 MP3 Circuit 13 Hydraulic Press (Room 126) Machinery (secured using "KeyWatch")	1 1 1 1 7			11

BUILDING /LOTO OBSERVATION	Good	Risk 0	Risk 1	Total
<u>#94 Experimental Hall B</u> MV Water supply for eyewash station Moeller Magnet Power Supply Prime-X Magnet Power Supply Trans TB P1 circuit 23 SB-ESB circuits 1, 5, 10 MV Fire sprinkler system	3 1 1 1 3 4	1 (wrong lock, no tag)		4/10
<u>#96 Experimental Hall C</u> ESC/ABL 8 Magnet Power Supply Power Supply Rack #HCO 1215 CUPH #21 SEAL power Supply	1 4 1 1 1			2/6
<u>#96B Hall B Gas Shed</u> LN2 Filling station	1			1
<u>#97 Counting House</u> MDP B3 CHP3 circuits 35, 37, 39, 41 Fire Sprinkler Zone Valve (lower level)	1 4 1			6
<u>#98 Cryo Weld Shop/Service Building</u> B4P1 circuits 1a, 1b, 14, 16 B4P5 circuits 6, 16, 18 B4P-5 circuits 6, 10	4 3 2			9
<u>#101 Experimental Hall A</u> A/AP/ELE circuits 7, 35 A/AP/HAD circuits 8, 36 TA-P1 circuits 26, 30	2 2 2			6
<u>#102 End Station Refrigerator Building</u> Panel W3 circuit 10	1			1
		1/2	2/0	49/209

APPENDIX A

SCORING SYSTEM FOR LOCKOUT/TAGOUT EVALUATION

Observance Score = 100 minus...

2000 * fraction of LO/TO situations with a risk code of 4

400 * fraction of situations with a risk code of 3

100 * fraction of situations with a risk code of 2

20 * fraction of situations with a risk code of 1

LO/TO situations with more than one lock applied (e.g., group LO, or when more than one person has applied a lock, are weighted as $[1 + (\text{total LO observations})]$ (risk weighting above).

Risk Code assignment derives from the LO/TO action (or lack of), not the overall work process.

Deficiencies include (but are not limited to) the following:

1. Complete absence of LO/TO when needed (personnel are observed working on the equipment).
2. LO/TO is absent when appropriate, but work is not in progress. (For example, a motor has been removed, wire ends are exposed, and the disconnect is unlocked.)
3. LO/TO does not prevent non-malicious re-energizing of the associated energy source.
4. LO/TO fails to control all energy sources.
5. Tag is missing.
6. Tag has incomplete, illegible, or erroneous information.
7. Tag has been reused.
8. Incorrect lock used.
9. LO/TO used for other purposes.

These observations can be drawn retrospectively from EH&S inspection reports if those reports include observations of correctly executed LO/TO.

Re-crediting points for corrective actions: The objective of the annual LO/TO evaluation is to improve our practices and safety. Observed deficiencies that are entirely corrected prior to the completion of the evaluation will allow an 80% re-credit of points lost under the Observation Score Formula. Corrections to equipment related deficiencies might consist of modified work practices (a TOSP, for example) pending permanently installed modification.

Subject: 2004 LO/TO Audit

From: Carter Ficklen <ficklen@jlab.org>

Date: Fri, 10 Sep 2004 11:01:50 -0400

To: jjmurphy <jjmurphy@jlab.org>

CC: Mary Jo Bailey <mbailey@jlab.org>, beeler@jlab.org, Linda Even <lle@jlab.org>

Hello Jim,

I have reviewed the 2004 LO/TO Audit that was presented at the EH&S Committee meeting today.

I have no comments and recommend approval of the report.

Thanks,

Carter

cc: EH&S Comm. file